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Functional outcome of long proximal femoral nail versus Short proximal femoral nail in Peritrochanteric fractures in elderly patients

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ABSTRACT
BACKGROUND AND OBJECTIVES: *Intertrochanteric fractures account for 5% of all hip fractures and 35–40% of these fractures are unstable three or four part fractures .(4,5)*
Operative treatment is the best option in most of the trochanteric fractures. 10Evolution of intramedullary devices is a result of dissatisfaction with the extra medullary devices in intertrochanteric unstable fractures. Intramedullary nailing, with less operative time and less operative blood loss allows early weight bearing with less resultant shortening on long term follow up.14Our main aim was to compare the effectiveness & drawbacks of short PFN vs long PFN in the management of pertrochanteric fractures.
MATERIALS AND METHODS: *This study was randomised, time bound, hospital based study conducted in a tertiary hospital, betweenApril 2019 toApril 2022. The study included 41cases of unstable intertrochanteric fractures of Group 1which were operated with Short PFN&Group 2 patients which were operated with Long PFN, intraoperative parameters, post-operative data & events were noted. Radiological assessment for progression & time of union, fracture alignment & implant related complications were analysed. All patients were accessed in immediate post op, 12 days, 1 month, 3months, 6months, 1 year& at2 years with Harris hip score. After data collection, data entry was done in excel worksheet. Data analysis was done with help of SPSS software version 23.*
RESULTS: *The average blood loss during the surgical procedure of short PFN was 100 ml while that in long PFN was 150 ml. In short PFN group, patients had operative time (from incision to closure) of 30-50 minutes with average of 43.6 minutes whereas in long PFN operative time was 45-90 minutes with average of 64.3 minutes. The Harris hip score was calculated for both the groups at 3 and 6 months and mean HHS for short PFN was 76.63 and 82.33 whereas for long PFN average score was 79.87 and 85.43 at 3 and 6 months respectively. Few patients also complained of thigh pain which included 7 patients (13%) of short PFN and 2 patients (4.5%) of long PFN.*
INTERPRETATION AND CONCLUSION:
In our results it was evident that the use of Long PFN has advantages over Short PFN in terms of the less postoperative complications, less mean time of union & better lower extremity functional scores.Most of the complications of proximal femoral nailing are surgeon and instruments related which can be cut down by proper patient selection, good preoperative planning and preoperative good reduction before entry and correct length of the screws

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I. INTRODUCTION

Intertrochanteric fractures occur commonly in elderly patients.Cummings et al[1]stated four possible factors for prevalence of intertrochanteric fractures in elderly 1) Inadequate local shock absorbers such as muscles and fats 2) Osteoporosis and reduced bone quality 3) Slowing down of protective reflexes 4) Orientation of the fall over the hip. Most intertrochanteric femoral fractures occur in elderly individuals as a result of low energy trauma like a simple fall due to osteoporotic bones while in younger patients these fractures usually result from high-energy trauma. [2] Incidence of these fractures has increased primarily due to increase in life span and sedentary life style.[3] Intertrochanteric fractures account for 5% of all hip fractures and 35–40% of these fractures are unstable three or four part fractures .[(4,5)]

Due to difficulty in obtaining anatomical reduction, management of the unstable intertrochanteric fractures in elderly patients is challenging and controversial.[6,7] Osteoporosis and instability are the most important factors preventing early weight bearing and leading to unsatisfactory results in these cases.[6,8,9] .

Operative treatment is the bestoption in most of the trochanteric fractures. [10] Conventional implants like dynamic hip screw, angular blade plates or cephalomedullary nails can be used for the successful treatment of stable intertrochanteric femoral fractures.[11]The use of intramedullary devices may allow a faster restoration of postoperative walking ability, when compared with extramedullary sliding devices.[12]

The goal of treatment of any fracture fixation is restoration of the patient to his or her pre-injury condition as soon as possible. This factor leads to decision of internal fixation of these fractures to increase patient comfort, decrease hospital stay and avoid the complications of prolonged recumbency.[13]

Intramedullary implants like the PFN have an advantage in such fractures as their placement allows the implant to lie closer to the mechanical axis of the extremity, which decreases the lever arm and bending moment on the implant. Intramedullary nailing, with less operative time and less operative blood loss allow early weight bearing with less resultant shortening on long term follow up.[14]

This study was aimed to investigate the efficacy of short and long proximal femur nail by comparing blood loss, operation time, postoperative complications, periprosthetic fracture and patient outcomes.

II. MATERIALS AND METHODS

A prospective study was conducted in our institute between after seeking approval from IEC. The patients were followed up for a period of six months.

The study was carried out in the department of orthopaedics at our institute. Total of 41 patients have been included in study out of which 24 belonged to group 1 and were operated with short PFN and rest 17 were group 2 operated with long PFN. Both the groups included patients with peritrochanteric fractures (intertrochanteric fractures with maximum of 3 cm extension below lesser trochanter).

Inclusion criteria

- All unstable intertrochanteric fractures based on AO system of classification
- All patients above 50 years of age.

Exclusion criteria

- All patients with any pathological cause for the fracture
- All young patients
- All patients with multiple limb fractures
- Patients with any contraindications for operative management

FOLLOW UP PROTOCOL: Pts were called for follow up every month, on follow up following aspects were noted: Deformity, Complaints of pain(if any), Range of Hip & knee movements, Shortening, whether the patient resumes his occupation to pre injury state, ability to sit cross legged and squat, walking ability with or without support.

METHOD OF RANDOMISATION: Double blind method. Association of various qualitative parameters were done with help of Pearsons Chi square test.

III. RESULTS

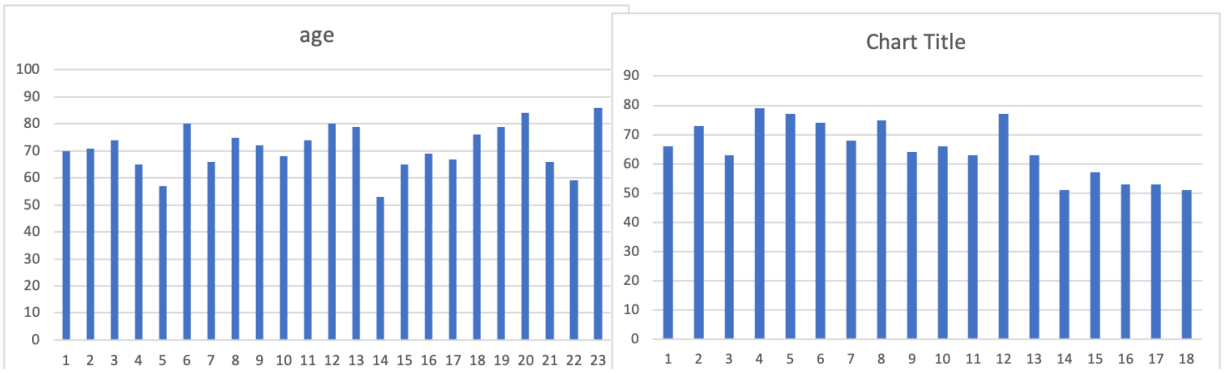
41patients went for surgery for peritrochanteric fracture during the period of study. The patient characteristics of both groups was not significantly different. AO 31-A1 and A2 were most common type of fractures in both groups. Out of 24 patients in group 1, 7 cases were AO A1 type, 13 were A2 and 4 patients were A3 type. In group 2, out of 17 patients, 7 were A3 type,8 cases were A2 and only 2 cases were A1

Majority patients in both the groups were above the age of 50 and sustained injury due to low energy trauma. Average age of the patient treated with short PFN was 70.5 while that with long PFN was 65.3 years. The average blood loss during the surgical procedure of short PFN was 100 ml while that in long PFN was 150 ml. In short PFN group, patients had operative time (from incision to closure) of 30-50 minutes with average of 43.6 minutes whereas in long PFN operative time was 45-90 minutes with average of 64.3 minutes. In post-operative period there was no significant difference. Two cases of short PFN and one case of long PFN had serous discharge and soakage which eventually resolved with change of antibiotics. Later both the groups were evaluated in post op period and at 3rd month to compare the outcome. The radiological signs of union were present in almost all the patients at 3±1 month. The Harris hip score was calculated for both the groups at 3

months,6 months and mean HHS for short PFN was 76.63 and 82.33 whereas for long PFN average score was 79.87 and 85.43 at 3 and 6 months respectively. Few patients also complained of thigh pain which included 7 patients (13%) of short PFN and 2 patients (4.5%) of long PFN. During 3 months of follow up, implant related complication was seen in one patient of short PFN (infected implant with loosening of proximal screw) and 1 patient of long PFN group (lag screw cut out)

AVERAGE AGE

SHORT PFN-70.5 **LONG PFN- 65.3**



SEX

SHORT PFN- 9/15 **LONG PFN-7/10**

AO CLASSIFICATION- A1/A2/A3

SHORT PFN- 6/11/0 **LONG PFN-7/13/4**

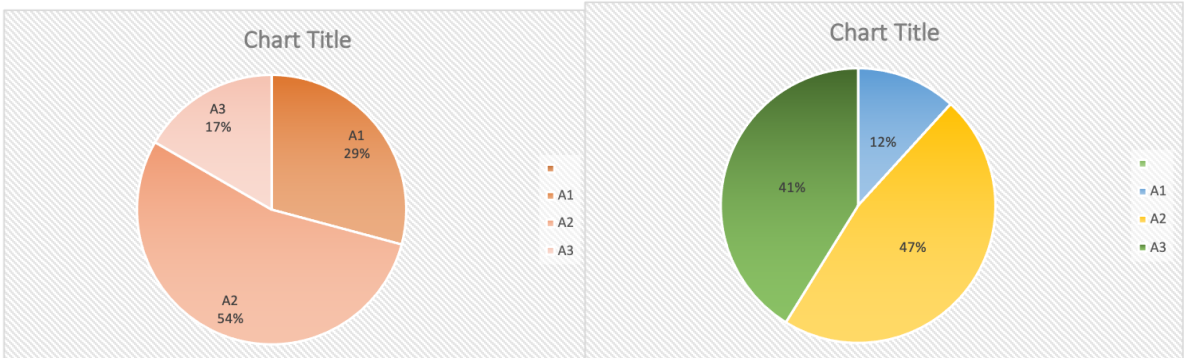


TABLE- PATIENT STATISTICS

Parameter	Long PFN	Short PFN
Average operating time(min)	64.3	43.6
Union(weeks)	14	15.1
Average blood loss	150	100

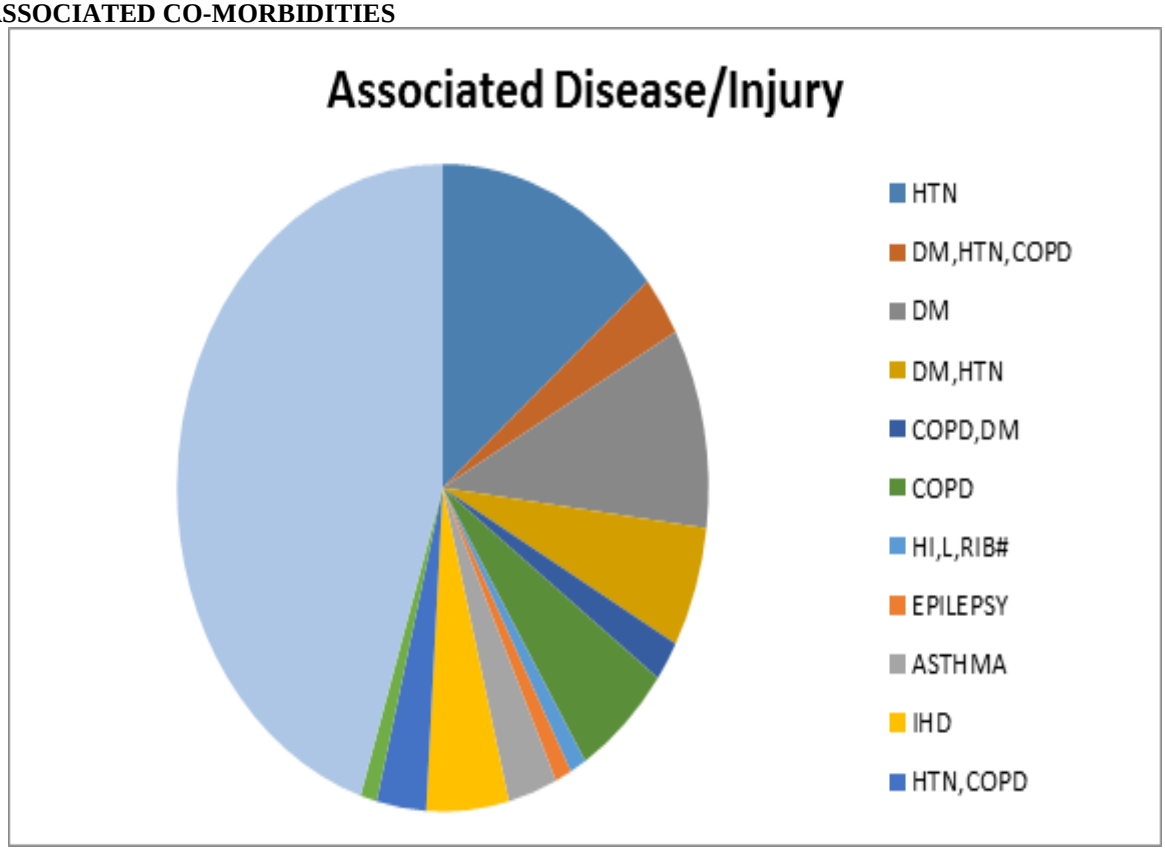
TABLE- COMPARISON OF HARRIS HIP SCORE (IN PRESENT STUDY WITH OTHER STUDIES)

Study	Year	Harris Hip Score
Shyamkumar et al[28] (Long PFN)	2017	79.33
Shyamkumar et al[28] (Short PFN)	2017	77.30
Present Study (Long PFN)	2021	85.43
Present Study (Short PFN)	2021	82.33

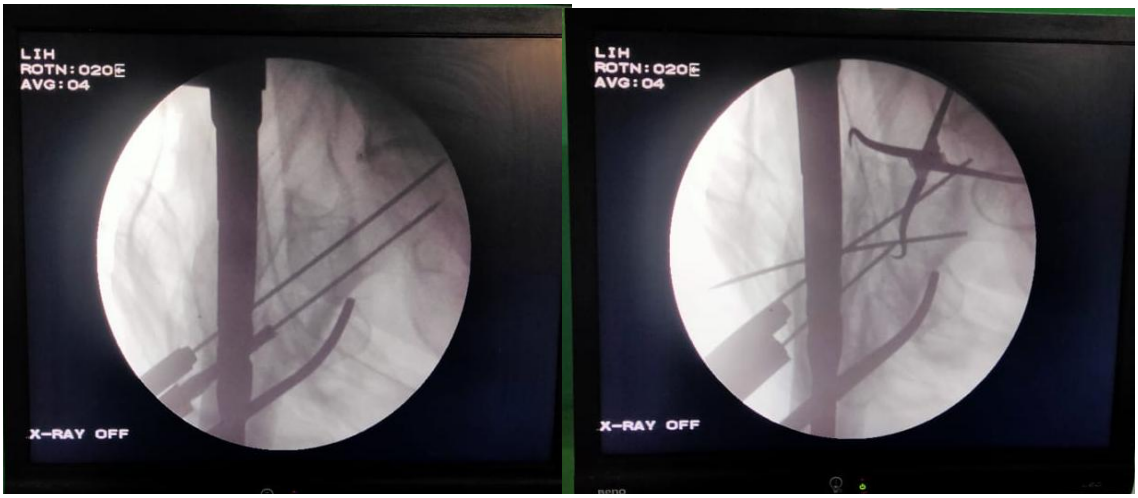
TABLE- COMPARISON OF THIGH PAIN(%) (IN PRESENT STUDY WITH OTHER STUDIES)

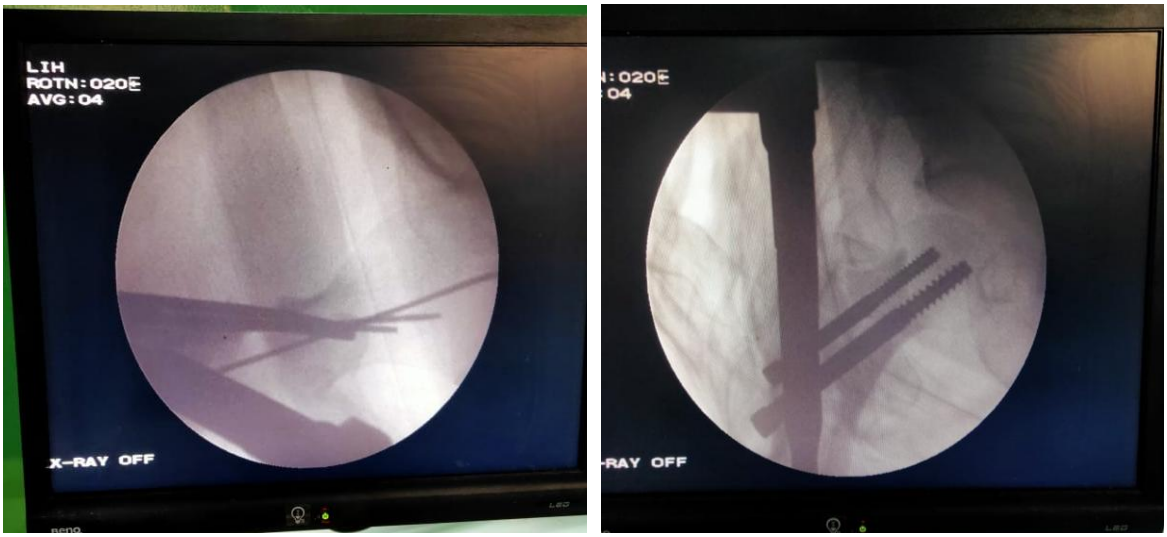
Study	Year	Harris Hip Score
Shyamkumaret al[28] (Long PFN)	2021	6.66
Shyamkumar et al[28] (Short PFN)	2021	20
Present Study (Long PFN)	2021	4.5
Present Study (Short PFN)	2021	13

ASSOCIATED CO-MORBIDITIES



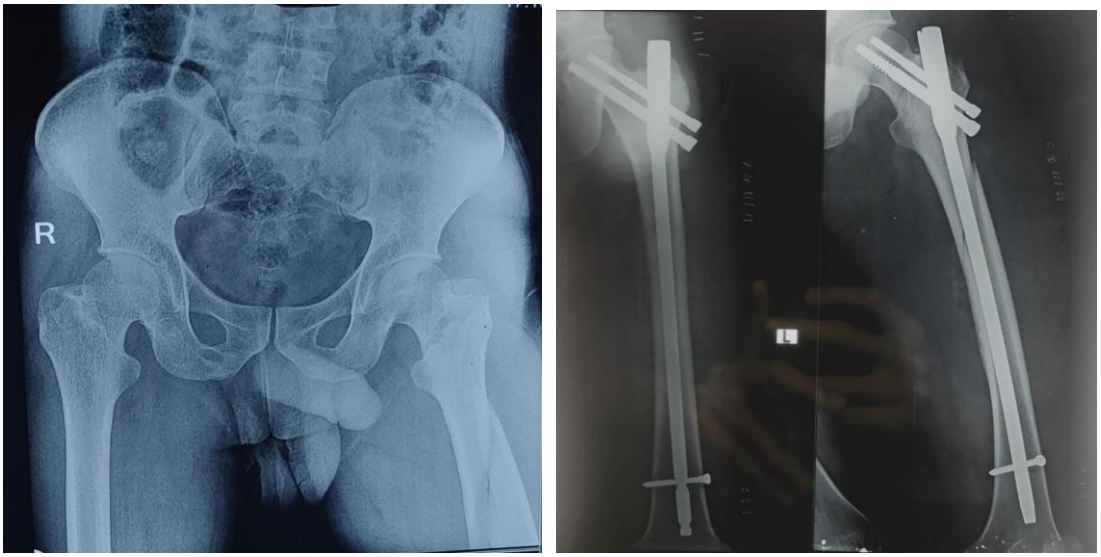
INTRA OP PHOTOGRAPHS



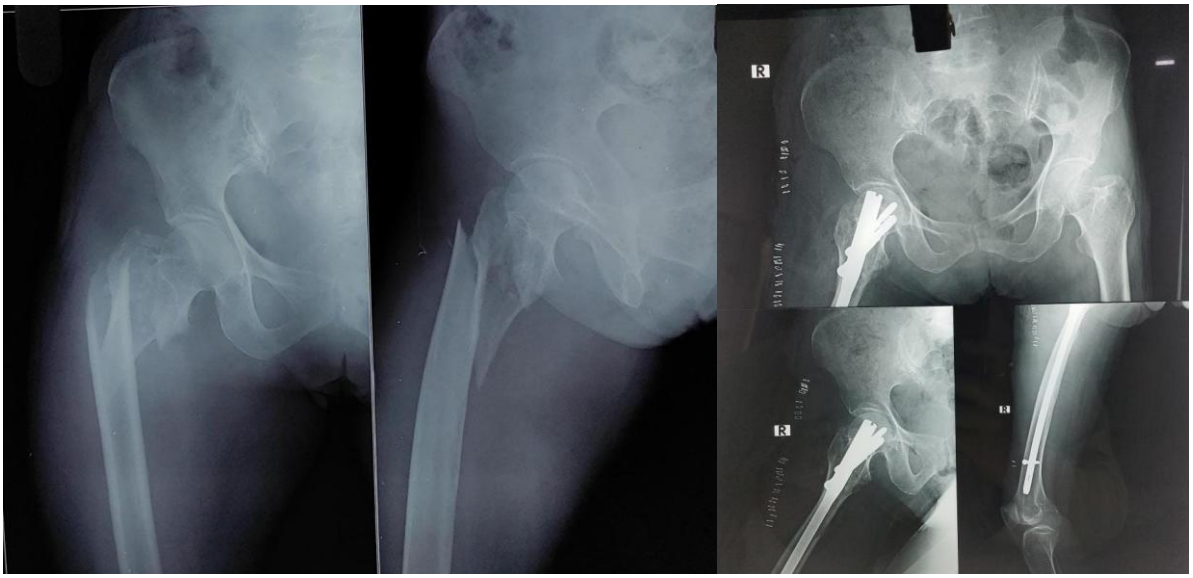


LONG PFN

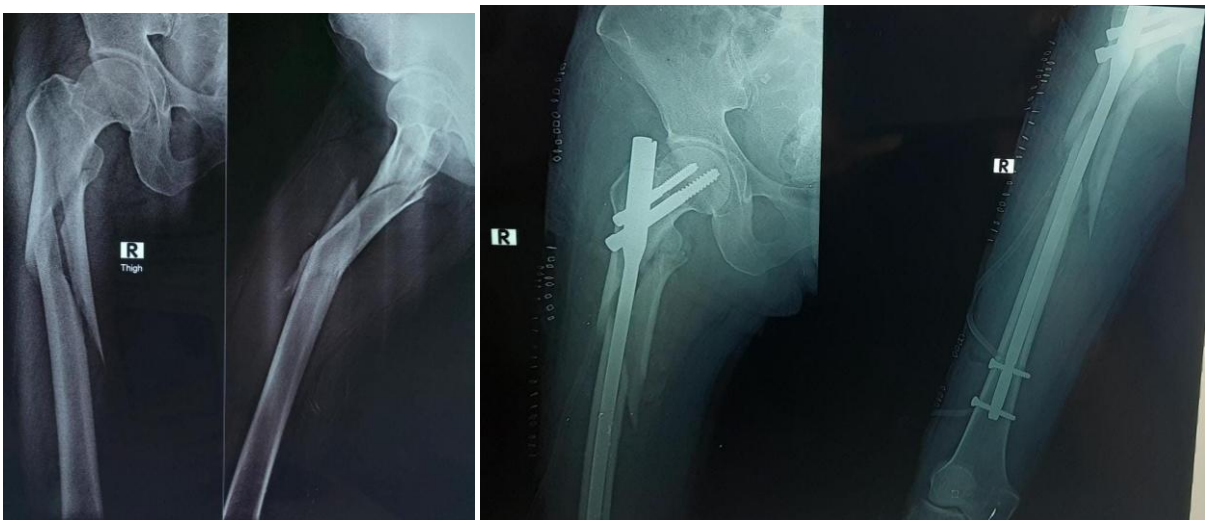
CASE 1



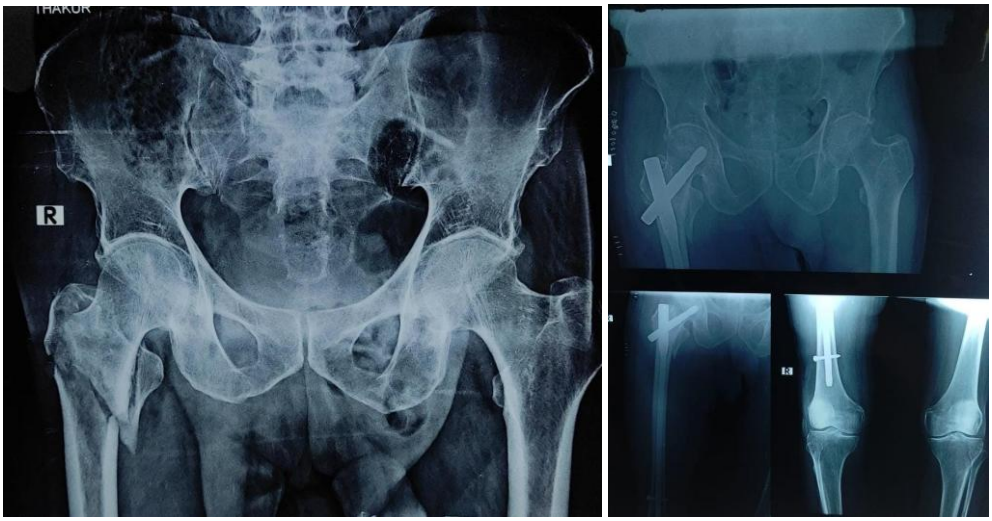
CASE 2



CASE 3



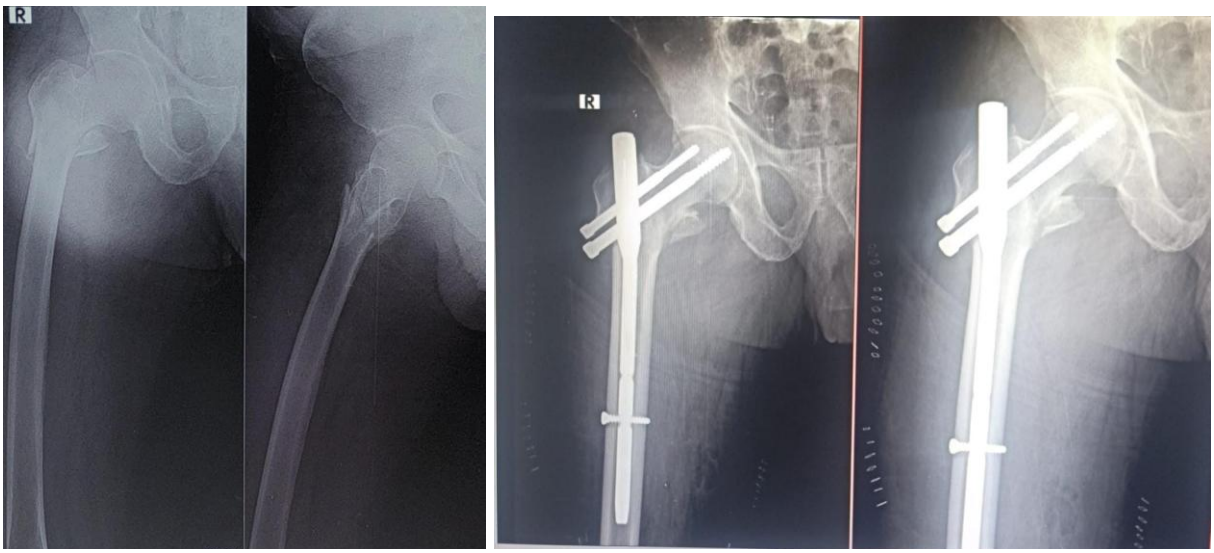
CASE 4



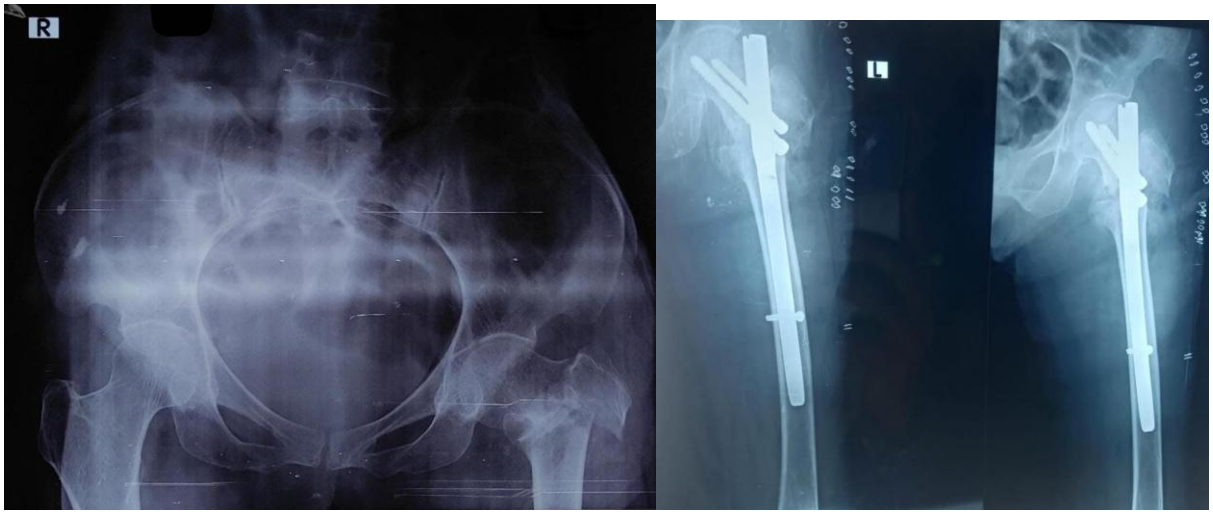
SHORT PFN

CASE 1

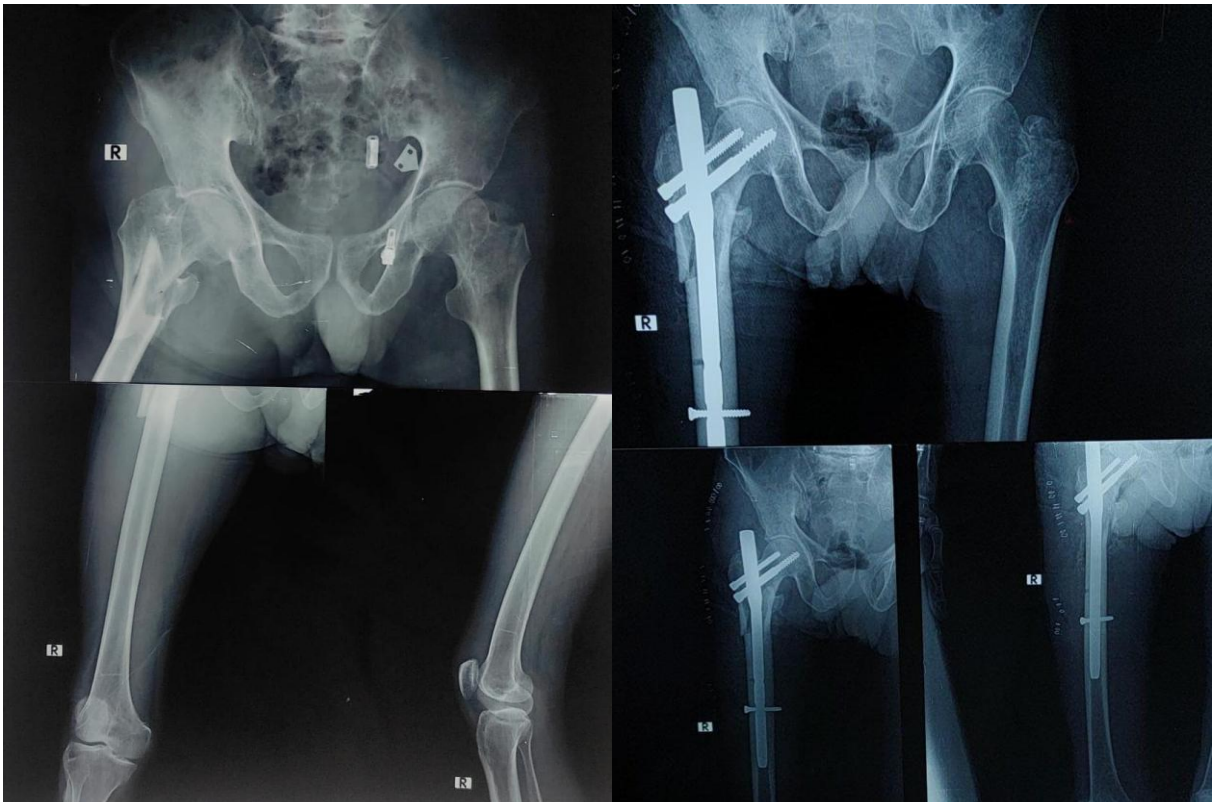
CASE 2



CASE 3



CASE 4



IV. DISCUSSION

The associated mortality and morbidity with hip fractures is significant[15] . An ever increasing aged population onlycompounds this problem. The number of fragility hip fractures is expected to rise exponentially with time and so are the corresponding costs[16] . Almost 90% of hip fractures are sustained after having a fall[17] . DEXA is the best indicator for predicting pertrochanteric fractures[18] .The angle of insertion of a nail during surgery also is an important factor, since the pre-stress of the nail depends on the angle of insertion[19] .Lag screw cut out in the treatment of pertrochanteric fractures is well documented[20,21] .Ideal lag screw placement should have a tip-apex distance of less than 25mm to avoid a screw cut out[22,23] . Eccentrically placed lag screws causes bothrotational cut out and varus collapse. Around 12 % of pertrochanteric fractures undergo progressive rotation as they collapse and rotation has been shown to more common in cases with lag screw out[24,25]. Patients who underwent short PFN procedures in the current study had lesser bleeding as compared to the long PFN group.

Proximal reaming and insertion of a longer nail leading to opening of the medullary canal leads to increased blood loss. Most of the time, such a blood loss is concealed[26]. The ethnic background of the patient should be borne in mindwhile operating, especially the Asian population. Anexcessive anterior bow in a relatively shorter femur should bepaid special attention[27].The nail entry point has to be precise.Longer nails are recommended in elderly patients with significant osteoarthritis. In our study we preferred a longer nail in an anticipated extension of sub-trochanteric fracture looking like a normal intertrochanteric fracture forced us to use Long PFN instead of risking with short PFN.

V. CONCLUSION

In our results it was evident that the use of Long PFN has advantages over short PFN in terms of the less postoperative complications, less mean time of union & better lower extremity functional scores. Most of the complications of proximal femoral nailing are surgeon and instruments related which can be cut down by proper patient selection, good preoperative planning and preoperative good reduction before entry and correct length of the screws.Our sample size reflects the routine patient inflow in our hospital. A study with a larger sample size would have made a better assessment of this surgical intervention. As our study was time bound the patients were followed up for a minimum of 3 months and a maximum of 2 years. Therefore the long-term effects of this intervention remains unknown in our study. A longer follow up would have made a complete assessment of this surgical intervention.

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CONFLICT OF INTEREST: None declared

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